

EXPERIMENTING WITH THE TESLA COIL.

By H. GERNSBACK.

There seems to be a general dearth of matter on this subject. This is not surprising when we bear the fact

in mind that literature on Tesla high frequency currents is very scarce indeed. The few books treating upon the subject are so purely technical that the average experimenter gets hopelessly entangled in his efforts to plow through the maze of theories, foot-notes and technicalities, useful only to the hardened scientist.

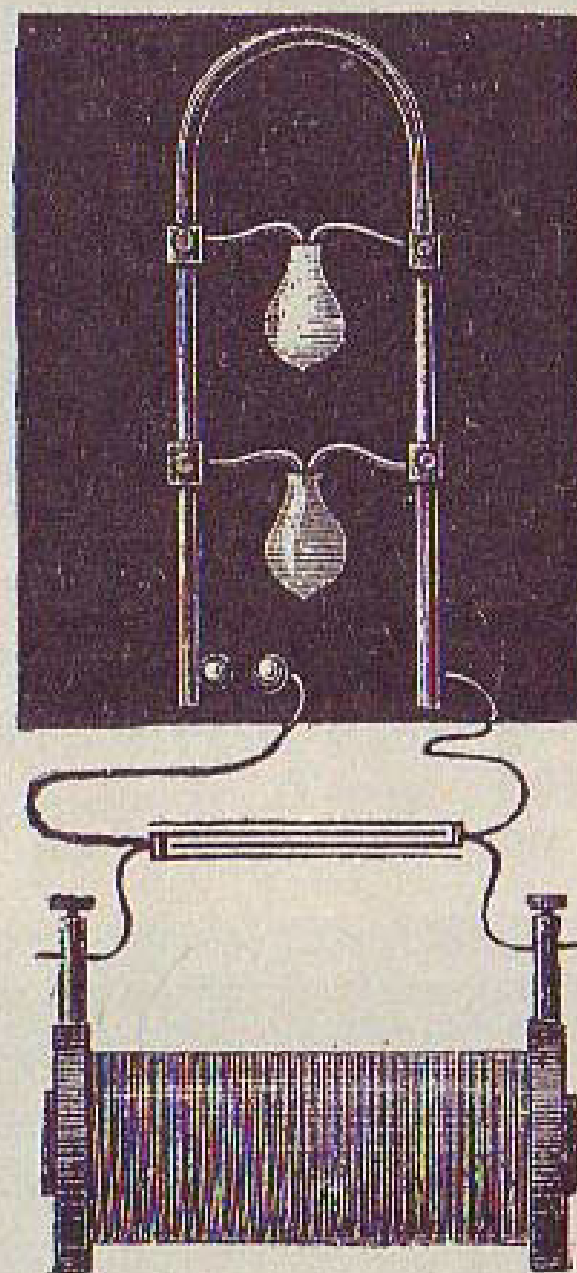


Figure 1

The scope of the present article is to make the experimenter and amateur more fully acquainted with the wonderful high frequency currents, without indulging too much in theory, so thoroughly hated by the young experimenter.

Any of the experiments described in this article can be carried out with the Tesla coils described elsewhere in this book.

In some of the illustrations in this chapter a coil resembling a common induction coil is shown for simplicity's sake, but it is of course understood that same stands for the Tesla coil, as none of the experi-

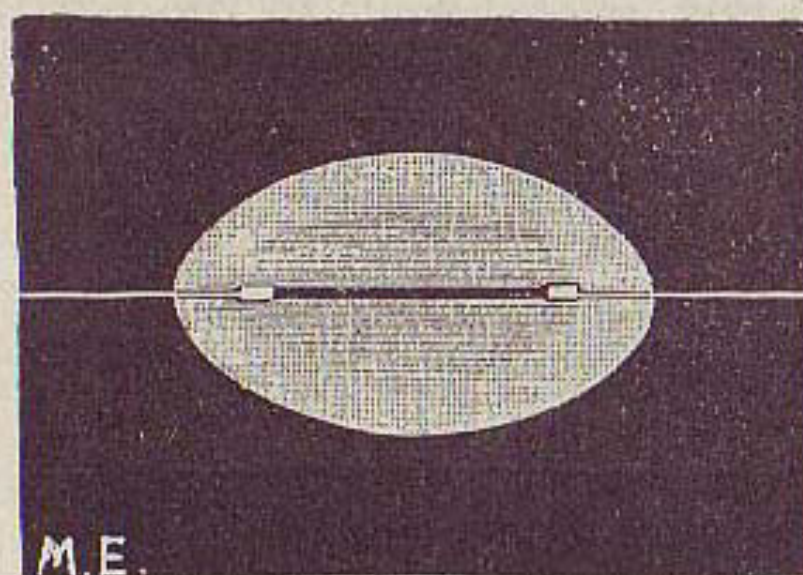


Figure 2

ments can be performed with a spark coil alone, no matter how large.

Although the potential of a well constructed Tesla

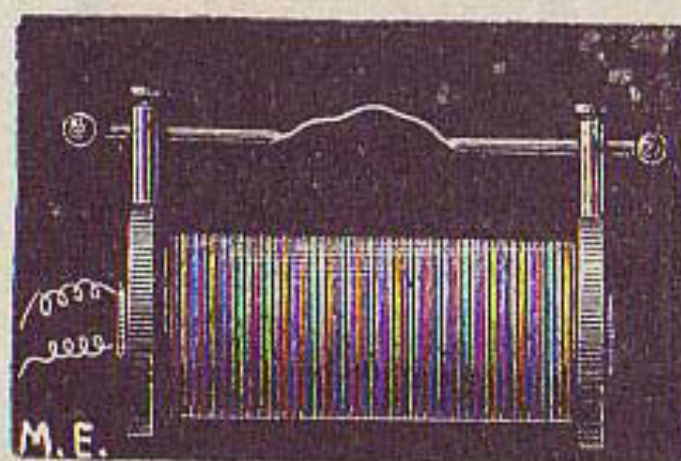


Figure 3

coil runs up into hundred thousands of volts, such currents, as explained elsewhere, are harmless to the human body. For this reason experiments with such currents are less dangerous than those made with even a three-inch spark coil.

Possibly the most puzzling experiment to the individual acquainted only with low tension work is the phenomenon of the impedance. The meaning of this word is "seeming resistance." If we short-

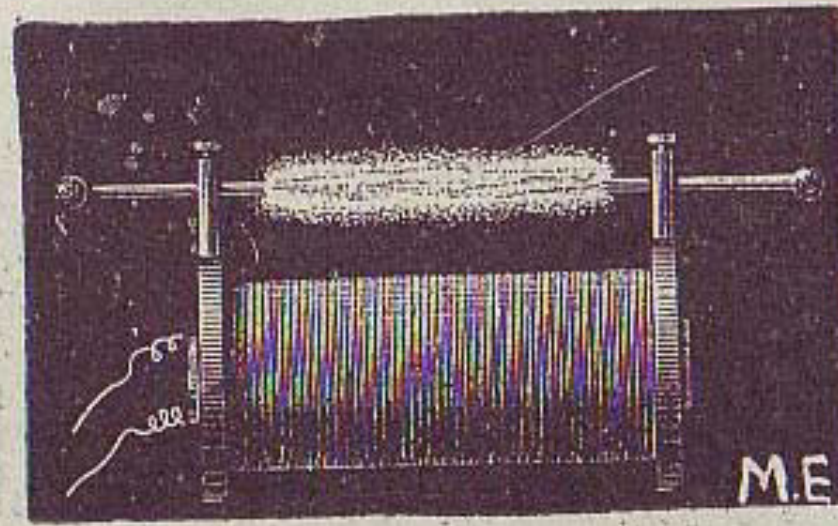


Figure 4

circuit an electric lamp by means of a heavy wire, we would hardly expect that we could light up the lamp thus short-circuited, under ordinary circumstances. By means of Tesla currents, however, we

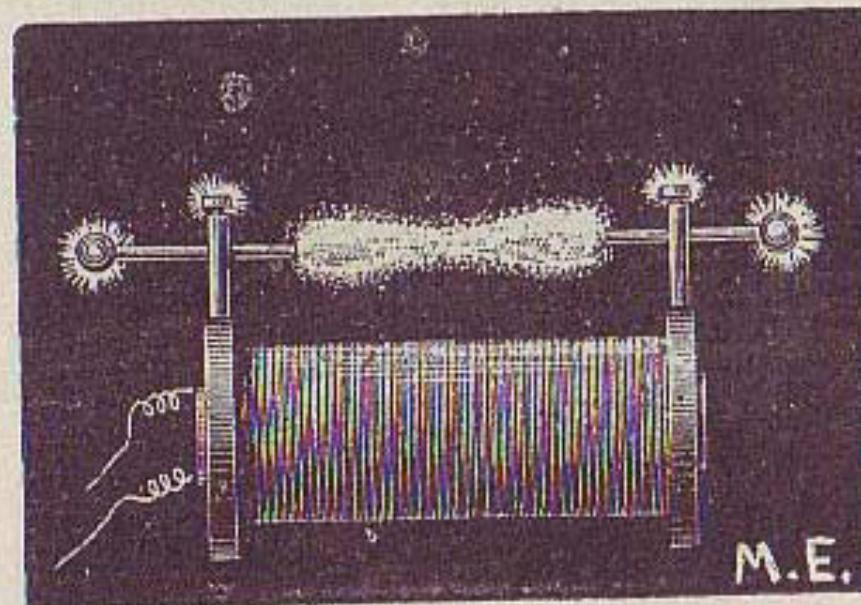


Figure 5

can light up several lamps, despite their being shorted with a heavy (No. 8 or 9) wire.

The arrangement is shown in Fig. 1. One or more 50-volt lamps are made to slide up and down on a

heavy copper wire loop. This loop is connected on one side to the Tesla coil, bridged by a large condenser (Leyden jar). The other wire from the condenser terminates at a brass ball. Another similar

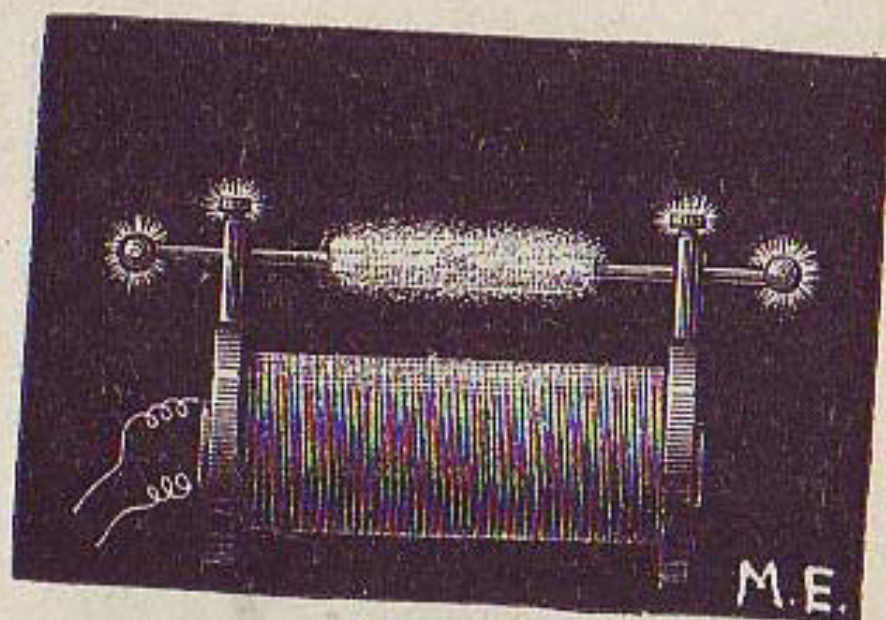


Figure 6

ball is placed opposite the first one and is connected to the wire loop.

In operation intense white sparks jump between the balls. By moving the lamps up and down the loop,

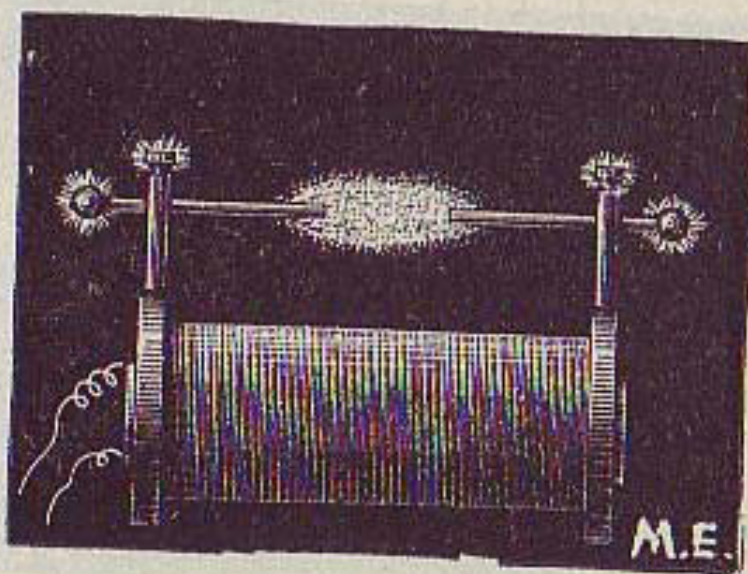


Figure 7

the highest degree of incandescence is quickly ascertained.

Experiments with the impedance will come out best when the wire of the loop is very heavy. A copper

rod even $\frac{1}{2}$ inch thick bent into shape as shown in Fig. 1 will give excellent results.

Another interesting experiment with the impedance

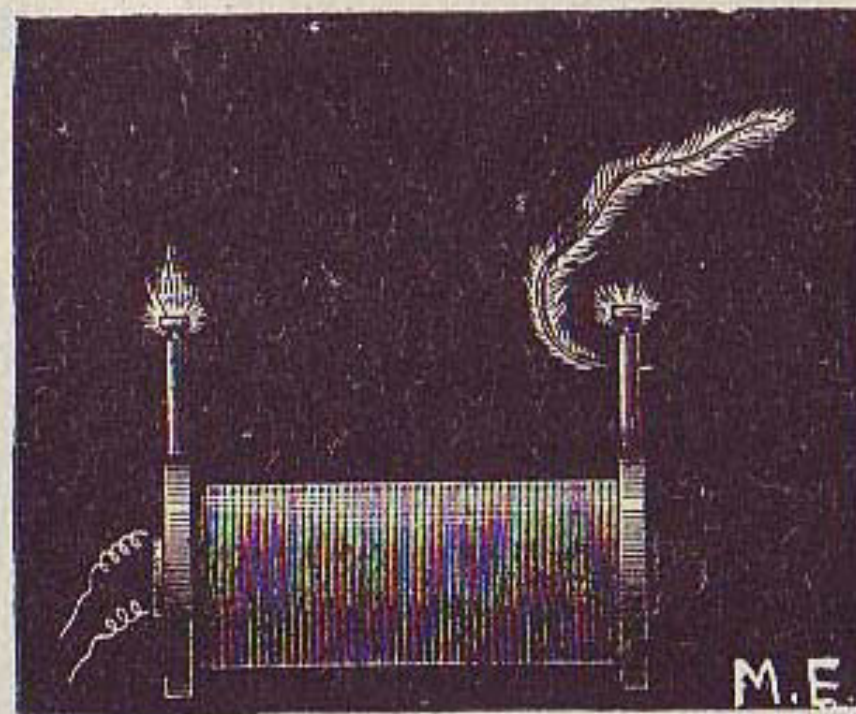


Figure 8

is shown in Fig. 2. It represents an ordinary incandescent lamp having a straight filament. One would be led to think that the current would take its way

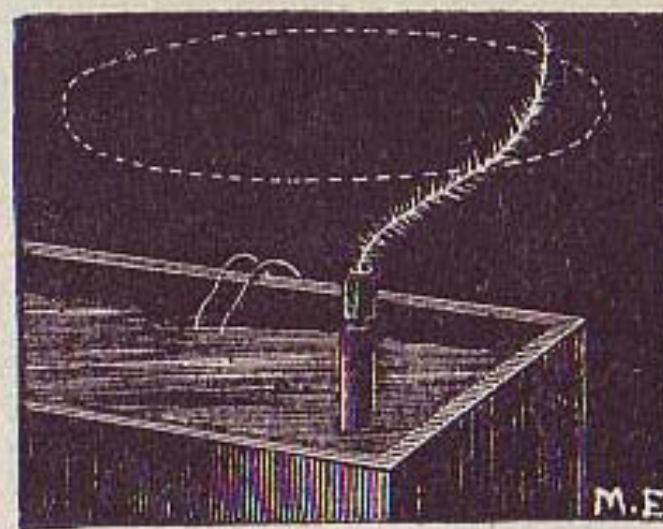


Figure 9

from terminal to terminal. Under certain conditions, however, the carbon filament stays black, and sparks jump from one terminal to the other, as if the filament was not there at all, or as if it were an insulator.

In operation, five typical forms of discharges are observed with the Tesla coil. If we use little current (amperage) in the primary circuit, we obtain a thin light thread between two sharp points (Fig. 3). This thread is extremely sensitive and will change its position if one breathes lightly from a little distance. The slightest draft in a room causes the thread of light to flicker violently.

If we increase the amperage up to a certain extent, we produce the flame discharge (Fig. 4). This flame is capable of radiating quite a good deal of heat, and the noise produced by the flame is little; much less, in fact, than the spark discharge of a one-inch coil.

The previous two experiments could not be strictly termed as high frequency ones, as the alternations were comparatively low. If we increase the current still more we obtain the high frequency arc discharge. Same is characterized by the brush discharge which takes place on all the metal terminals (Fig. 5). The arc produces a good deal of ozone, which makes itself known by a peculiar, but pleasant and invigorating, odor.

By further increasing the amperage and by separating the discharging rods but little, we obtain a peculiar spark discharge composed of extremely thin, blinding, white threads enclosed in a large flame or spray (Fig. 6). This discharge is the most beautiful; it can be further intensified by using a strong air current trained against the spray. Sparks can be made to fly off similar to those produced by sharpening a metal tool on a grindstone. These electric sparks, when blown on the experimenter's skin, produce a rather unpleasant sensation, but are quite harmless.

Fig. 7 shows the fifth typical form of discharge. When the current is increased to its maximum, and when the oscillations have reached their highest value,

it is quite hard to confine the charge to the discharging rods. It is neither easy to obtain a spark discharge; and if produced at all it will only take place when the rods are quite close together.

A short piece of thin, cotton covered copper wire

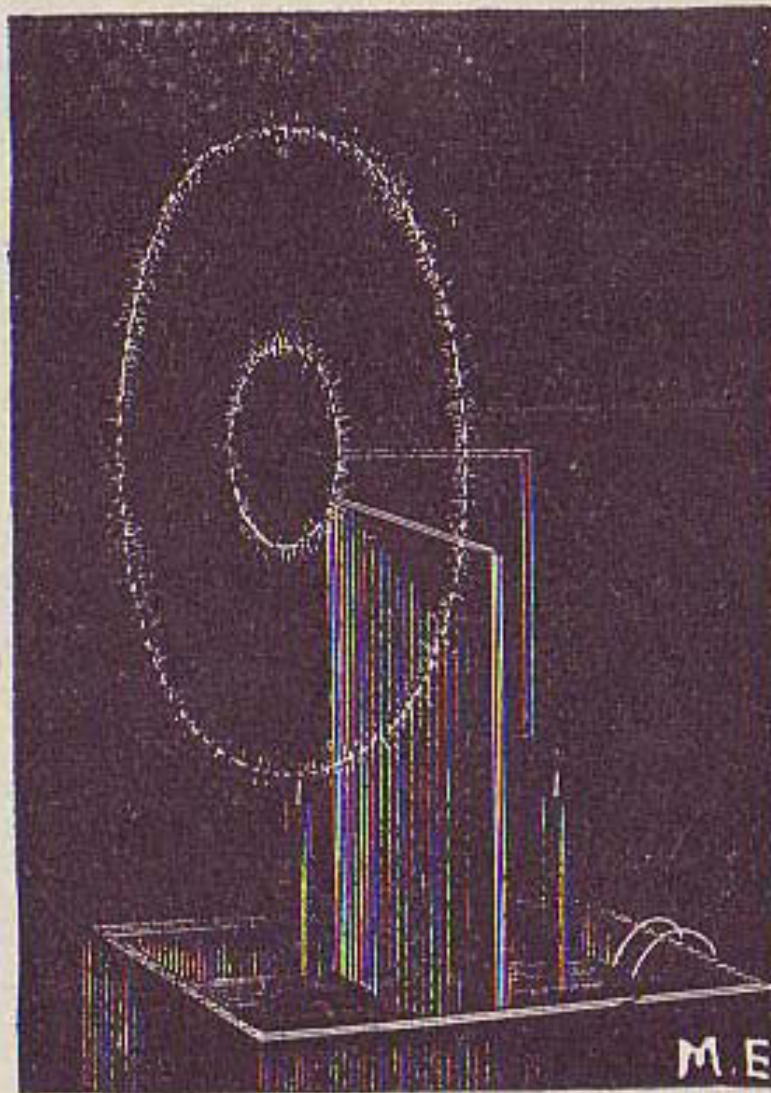


Figure 10

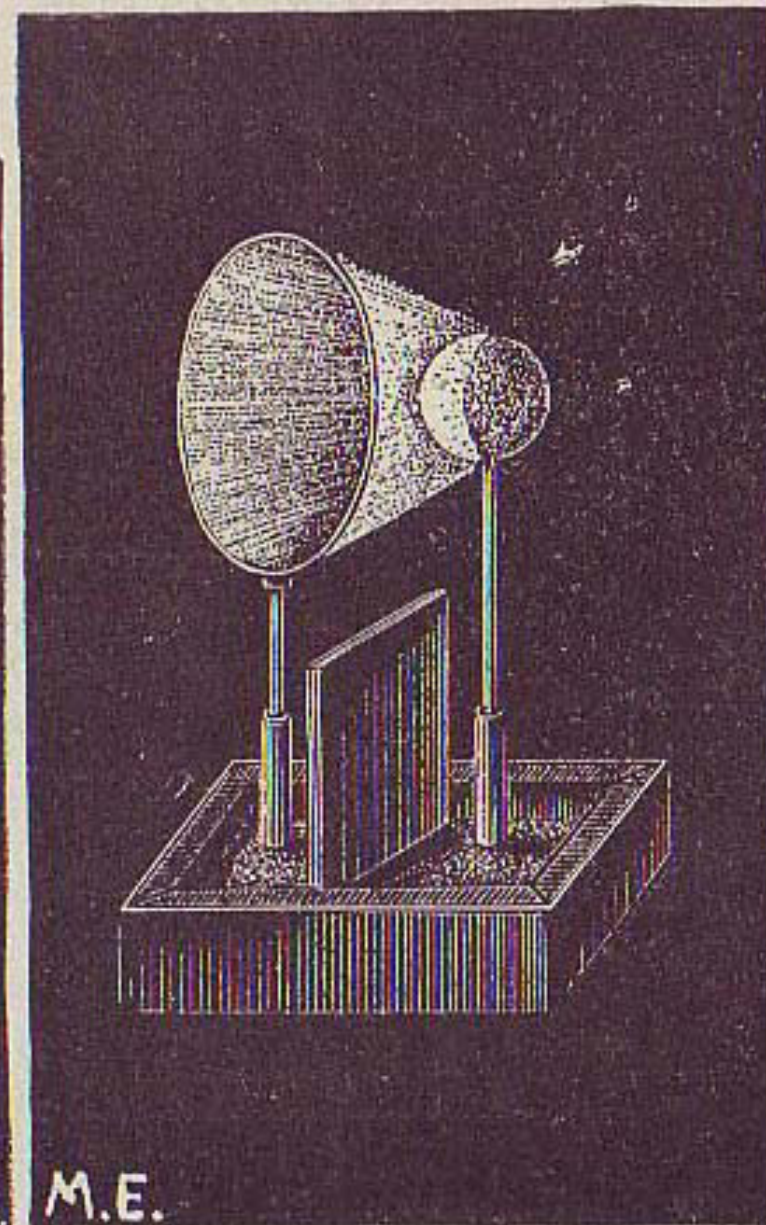


Figure 11

when attached to one end of the coil is enveloped in a beautiful light discharge (Fig. 8).

Fig. 9 shows another interesting experiment which, when produced in the dark, is quite impressive. A very thin, bare copper wire attached to one end of the coil, rotates in a circle. The length of the bare wire must be ascertained by experiment.

Two rings formed of copper wire, the smaller ring

placed into the larger one, and both connected to the poles of the coil, will show a very pretty discharge (Fig. 10).

By concentrating the effect the intensity of the light is greatly increased as shown in Fig 11.

A circle of copper wire is made, which is connected to one pole. The other pole carries a brass ball, its diameter being approximately $\frac{1}{4}$ of that of the circle. As soon as the coil is started, the discharge takes place between the surface of the brass ball and the rim of the circle. A hollow cone of light is formed, presenting a weird appearance.

ELECTRICAL STARS.

BY H. GERNSBACK.

It is surprising to find that almost every other amateur or experimenter never saw or heard of the wonders of a revolving Geissler tube, producing the marvelous electrical stars, although he has in his possession all the apparatus needed to produce them.

The majority of our readers are well acquainted with the Geissler tube, but to most of them, possibly, the thought never occurred to revolve a tube at high speed while in operation. At first thought we would be led to believe that a revolving tube would not look any different than one at rest, which is possibly the reason that very few try the experiment, but let them "discover" it and they will sit for hours in front of a silently revolving tube, watching the ever-changing stars.

When a tube is made to revolve at high speed and the vibrator of the spark coil works very fast, we see a luminous circle of various colors, depending of course on the natural colors of the tube. As the tube is revolving too fast, the eye cannot follow it,

placed into the larger one, and both connected to the poles of the coil, will show a very pretty discharge (Fig. 10).

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